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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/766,739 01/29/2004 Kazuhide Abe OKI.612 2843

20987 7590 01/10/2007
VOLENTINE FRANCOS, & WHITT PLLC
ONE FREEDOM SQUARE
11951 FREEDOM DRIVE SUITE 1260
RESTON, VA 20190

EXAMINER

INGHAM, JOHN C

ART UNIT	PAPER NUMBER
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2814

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS 01/10/2007 PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/766,739	Applicant(s) ABE, KAZUhide	
	Examiner John C. Ingham	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 19 October 2006.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 3-7,9,12-16 and 28-34 is/are pending in the application.
 - 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 3-7,9,12-16 and 28-34 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 29 January 2004 is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 - 1. Certified copies of the priority documents have been received.
 - 2. Certified copies of the priority documents have been received in Application No. _____.
 - 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>10/19/06</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The amendments to the claims, filed 19 October 2006, have been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims **3, 5-7 and 9** are rejected under 35 U.S.C. 102(b) as being anticipated by Higashi (US 6,342,444).
4. Regarding claims **3 and 6**, Higashi discloses in Fig 1G a wiring structure of a semiconductor device, comprising: a first insulating film (1) having plural grooves (one shown of a trench pattern, item 4, col 1 ln 46 and col 4 ln 13) formed therein, which has an interface (upper surface of item 1) in the horizontal direction between the adjoining grooves; plural wiring films (one shown, item 6) formed in the grooves of the first insulating film to protrude above the interface; plural barrier films (one shown, item 5, formed on bottoms of the wiring films, and formed on side faces of the wiring films to a height exceeding the interface; plural cap films (one shown, item 9, made of TiN)

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formed at least on upper faces of the wiring films, and which are each separated by the grooves, wherein the cap films are formed on parts protruding above the interface and are separated from each other by the interface, and wherein the cap films are formed only on uppermost faces of the wiring films and the barrier films.

5. Regarding claims **5, 7 and 9**, Higashi discloses in column 4 lines 47-52 the structure of claim 3 wherein the cap films may be made of TaN, W, or WN.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim **4** is rejected under 35 U.S.C. 103(a) as being unpatentable over Hagashi and Yu (US 6,958,291). Hagashi discloses the structure of claim 3, but does not specify that the cap films are an insulating film containing Si_xC_y as a principal composition. Instead Hagashi specifies conductive cap films such as TiN or WN.

Yu teaches that a cap film may be insulating or conductive, and that an insulating cap film may comprise SiC (col 5 ln 29) as a principal composition. It would have been obvious to one of ordinary skill in the art to combine the teachings of Yu and Hagashi. One of ordinary skill in the art would have been motivated to look to analogous art teaching alternative suitable or useful passivation or cap films, art recognized suitability

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for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

8. Claims **12-15 and 33** are rejected under 35 U.S.C. 103(a) as being unpatentable over Lim and Hagashi.

9. Regarding claim **12**, Lim discloses in Fig 14 a wiring structure of a semiconductor device, comprising: a first insulating film (72) having plural grooves (Fig 11, one shown in a hillock) formed therein, which has an interface (top surface of 72 around hillock) in the horizontal direction between the adjoining grooves; plural wiring films (84) formed in the grooves of the first insulating film to protrude above the interface; plural barrier films (56, 80), formed on bottoms of the wiring films, and formed on side faces of the wiring films to a height exceeding the interface, wherein the first insulating film has plural protrusions (hillock shown) protruding from the interface, and the grooves are formed in the protrusions, wherein the upper faces of the wiring films and the barrier films are substantially coincident with upper ends of the grooves. Lim fails to specify that the wiring structure includes plural cap films formed at least on upper faces of the wiring films, which are separated by the grooves and have substantially the same shape as uppermost faces of the protrusions.

Hagashi teaches that a cap film may be selectively formed only on wiring in order to reduce the capacitance (col 3 ln 8-18) and wiring resistance. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Hagashi on the device of Lim to reduce the capacitance and wiring resistance. The

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resulting structure of Lim with a selective cap layer on the wiring meets the limitation wherein cap films are formed on upper faces of the wiring films and have substantially the shape as uppermost faces of the protrusions.

The claim language "wherein the protrusions are formed through etching the first insulating film, using the cap films as a mask" describes a product by process. See MPEP 2113. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)

10. Regarding claims **13-15 and 33**, Higashi discloses in column 4 lines 47-52 the structure of claim 12 wherein the cap films may be made of TaN, TiN, or WN.

11. Claims **16, 28-32 and 34** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hagashi and Lim and further in view of Yu.

12. Regarding claim **16**, Hagashi and Lim disclose the structure of claim 12, but do not specify that the cap films are an insulating film containing Si_xC_y as a principal composition.

Yu teaches that a cap film may be insulating or conductive, and that an insulating cap film may comprise SiC (col 5 ln 29) as a principal composition. It would have been obvious to one of ordinary skill in the art to combine the teachings of Yu and Hagashi.

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One of ordinary skill in the art would have been motivated to look to analogous art teaching alternative suitable or useful passivation or cap films, art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

13. Regarding claims **28 and 32**, Lim discloses in Fig 14 a wiring structure of a semiconductor device, comprising: a first insulating film (72) having plural protrusions (one hillock shown) in which grooves are formed (Fig 11, one shown in a hillock), and which has an interface (top surface of 72 around hillock) in the horizontal direction between the adjoining protrusions; plural wiring films (84) embedded in the grooves on barrier films (56, 80). Lim fails to specify that the wiring structure includes plural first cap films formed on upper faces of the protrusions with substantially the same shape as uppermost faces of the protrusions, and second cap films formed on the first cap films and the first insulating film.

Hagashi teaches that a cap film may be selectively formed only on wiring in order to reduce the capacitance (col 3 ln 8-18) and wiring resistance. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Hagashi on the device of Lim to reduce the capacitance and wiring resistance. The resulting structure of Lim with a selective cap layer on the wiring meets the limitation wherein first cap films are formed on upper faces of the wiring films and have substantially the shape as uppermost faces of the protrusions.

Yu teaches that a second insulating cap film may be formed over a first selectively formed conductive film (col 5 ln 33-36), and that the insulating cap film may

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comprise SiC (col 5 ln 29) as a principal composition in order to passivate the structure (col 5 ln 25). It would have been obvious to one of ordinary skill in the art to use the teachings of Yu on the structure of Lim and Hagashi in order to passivate the wiring structure.

The claim language “wherein the protrusions are formed through etching the first insulating film, using the cap films as a mask” describes a product by process. See MPEP 2113. “[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)

14. Regarding claims **29-31 and 34**, Higashi discloses in column 4 lines 47-52 the structure of claim 12 wherein the conductive cap films may be made of TaN, TiN, or WN.

Double Patenting

15. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422

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F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

16. Claims 3 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1 of U.S. Patent No. 6,969,911. Although the conflicting claims are not identical, they are not patentably distinct from each other because claim 1 of the '911 patent recites a first insulating film having plural grooves, plural wiring films protruding from the insulating film, plural barrier films formed on bottoms of the wiring and also protruding from the insulating film, and plural first metal cap films formed on upper (top) faces of the wiring films.

Response to Arguments

17. Applicant's arguments with respect to claims 1-16 and 26-32 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

18. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John C. Ingham whose telephone number is (571) 272-8793. The examiner can normally be reached on M-F, 8am-5pm.

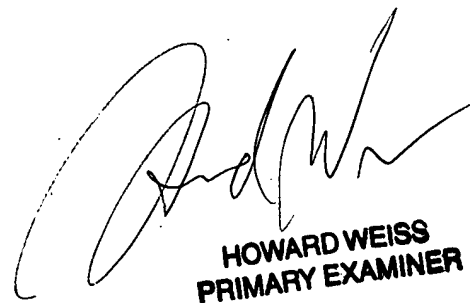
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

John C Ingham
Examiner
Art Unit 2814

jci



HOWARD WEISS
PRIMARY EXAMINER